#17/Appeal Brief 4.10.02 C. Wills

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Customer No. 026418

Docket No. GK-ZEI-3039/500343.20034

Applicant: Ulrich Simon et al. Group Art Unit: 2859

Serial No: 09/238,859 Examiner: G.Verbitsky

Filed: 1/28/99

For: Laser scanning microscope with AOTF

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Washington, DC 20231

BRIEF ON APPEAL 37 CFR 1.192

The $320.00 Appeal Brief fee is attached by check. This Brief is submitted in support of the Notice of Appeal filed on January 29, 2002 which was filed together with a petition and fee for a two month extension of time from the Final Rejection dated August 29, 2001, finally rejecting Claims 2, 4-5, and 7-9. This brief is filed in triplicate.

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1. REAL PARTY IN INTEREST

The real party in interest in the above-identified application is the assignee, Carl Zeiss Jena GmbH of Tatzend Promenade 1a, D-07745 Jena, Germany. The assignment was recorded in the USPTO on January 28, 1999.

2. RELATED APPEALS AND INTERFERENCES

No other appeals or interferences are known to appellant, the appellant's legal representative, or assignee which will directly affect, will be directly affected by or have a bearing on the Board's decision in the pending appeal.

3. STATUS OF ALL CLAIMS

Claims 1-8 were filed in the present original U.S. application filed January 28, 1999. Claims 1 and 3 were cancelled and Claims 2, 4, and 8 were amended in the Amendment filed on August 30, 2000. Claims 2 and 7 were amended, and Claim 6 was cancelled in the Amendment filed on July 16, 2001.

Claims 2, 4-5, and 8-9 are pending. Claims 2, 4-5, and 8-9 are rejected.

4. STATUS OF AMENDMENTS

All amendments have been entered. No amendments were filed after the Final Rejection.

5. SUMMARY OF THE INVENTION

It is known to combine lasers of different wavelengths in a laser scanning microscope by means of a beam splitter and to couple the lasers into a light-conducting fiber by means of an AOTF (acousto-optic tunable filter) with a grating which varies the refractive index and whose grating constant can be varied corresponding to its high-frequency driving. The wavelength, which is diffracted in the first order by the AOTF, and the intensity are adjusted by controlling the AOTF. Thus, by adjusting the AOTF, the intensity is adjusted by the amplitude of the sound wave and the wavelength is adjusted by the frequency of the sound wave.

The use of acousto-optics for line selection and attenuation of laser lines in a modular construction ***has the disadvantage that the transmission characteristics of the acousto-optic unit is highly dependent on temperature.*** This can be explained by the fact that a change in temperature brings about a change in the velocity of sound in the crystal material which makes itself apparent indirectly in a deviation from the optimum frequency and accordingly in a decrease in the diffraction efficiency. This leads to intensity losses and to possible intensity modulations in the scanned image.

For example, when an AOTF was adapted to 21°C, the transmitted output dropped to approximately 5% of the initial value with a change in temperature from 21°C to 35°C without corrective steps. Even with a change in temperature of only 4°C, an output drop of about 50% occurred.

Therefore, it is the primary object of the invention to ensure the stability of laser output for all required wavelengths in spite of uncertain and erratic setup conditions of the LSM (laser scanning microscope).

According to the invention, this object is met by a laser scanning microscope with an AOTF in the laser input-coupling beam ***comprising a temperature gauge provided in the environment of the AOTF*** or in the vicinity thereof or connected therewith. Also in accordance with the invention, a laser scanning microscope with an AOTF in the laser input-coupling beam path comprises ***that the AOTF and/or its environment are heated or cooled.***

The AOTF frequency can advantageously be controlled by driving the AOTF by means of a driver interface ***if the temperature is known. The temperature detection can be carried out for this purpose in the immediate vicinity of the AOTF, for example, directly at its housing.***

If a temperature deviation of more than +/- 1°C from a given reference value is determined, ***an automatic frequency readjustment can be carried out*** (claim 9) within a given frequency window, preferably +/- 200 KHz, by the frequency determined at the reference value (temperature). ***The frequency can also be adjusted on the basis of temperature-dependent frequency values which have been recorded beforehand and stored in tables.***

The temperature deviation can also be compensated by an increase ***in intensity*** which compensates for the efficiency loss of the AOTF.

In reference to Figures 1 and 2, a temperature gauge TF which detects the ambient temperature of the respective AOTF is attached directly to the AOTF. This ambient temperature value is supplied to the driving unit 34 containing a computer which, based on previously stored correction curves and a RS 232 driver circuit, adjusts and optimizes the AOTF frequency depending on the temperature in a given frequency window; that is, it compensates for the frequency shift occurring as a result of the temperature deviation by increasing or decreasing frequency. However, this compensation can also be carried out automatically based on the intensity value of the laser radiation picked up by the monitor diode 19 and supplied to the driving unit in that the monitor diode 19 is connected with the evaluating unit and the AOTF driver readjusts the frequency based on the recorded intensity signal of the monitor diode 19 by varying the frequency preferably by +/- 200 KHz until a maximum signal is reached.

A further advantageous solution consists in providing the AOTF with separate heating or cooling. (see heating/cooling plate P in Fig. 2)

In a particularly advantageous manner, the crystal is heated to a range of greater than 35°C, for example, 40 C, and is maintained constant within a given window. The laser output in the first order of diffraction then remains constant within close boundaries over the entire temperature range of, for example, 15°C to 35°C.

The TeO2 crystal of the AOTF is arranged on a housing part G having lines Z to the voltage supply of the AOTF, wherein the traversing laser radiation is indicated schematically.

Located between the housing G and the TeO2 crystal is a plate P which can be heated or cooled electrically and whose voltage supply ST can be arranged on the outside of the housing as is shown.

The current supply ST is connected with a regulating unit which is connected with a temperature gauge that can be arranged directly at the TeO2 crystal or at the current supply ST.

The regulating unit can be part of the current supply ST or regulation can be carried out by means of the driving unit 34.

6. STATEMENT OF ISSUES PRESENTED

The following issues will be addressed in the argument section:

(1) Whether claim 2 is indefinite under 35 U.S.C. §112, first paragraph.

(2) Whether claim 9 is indefinite under 35 U.S.C. §112, first paragraph.

(3) Whether claims 2, 4-5, and 8-9 are obvious in view of a combination of the admitted prior art on pages 1-2 of the specification and Kemeny, U.S. 5,039,855 under 35 U.S.C. §103(a).

7. GROUPING OF CLAIMS

Required reasoning for the groupings below is provided in the supporting arguments if not provided here at 7.

(1) In regard to first ground of rejection under §112, first paragraph above (1), claim 2 is an independent claim and dependent claims 4, 5, 7, and 8 stand or fall with claim 2 in regard to the ground of rejection at (1).

(2) Claim 9 is a separate independent claim subject to a separate §112, first paragraph rejection (2), so claim 9 does not stand or fall with claim 2. More reasons for separate patentability are discussed in the argument.

(3) In regard to the third ground of rejection (§103(a)) at (2) above, claim 2 is an independent claim and dependent claims 4, 5, 7, and 8 stand or fall with claim 2 in regard to the ground of rejection at (2). Claim 9 is an independent claim, but it does stand or fall with claim 2.

8. ARGUMENT

I. The rejection §112, first paragraph of independent claims 2 and 9.

a. The 35 U.S.C. §112, first paragraph rejection of independent claim 2 is again properly and respectfully traversed below as it was in the previous response filed July 16, 2001 by using the same arguments.

The Final Office Action at page 2 states:

> "Claim 2: It appears that "regulation to a constant value" as stated at line 9 is not described in the specification.

First, for clarity, it is noted that claim 2 reads: "regulation to a constant temperature value."

Applicants had previously responded to this objection in the last amendment filed July 16, 2002 at page 4. Applicants pointed out the disclosure at page 2, lines 15-24, and also page 6, lines 1-5 by stating:

> "...in claim 9, the driving of the AOTF "by a constant frequency" is alleged to not be disclosed by the specification. ***Applicant respectfully points out the disclosure at page 2, lines 15-24 wherein it is discussed that the AOTF frequency can advantageously be controlled by driving the AOTF by means of a driver interface dependent on temperature,*** and that an automatic frequency readjustment is carried out within a given frequency window ... by the frequency determined at the reference value (temperature).
>
> Also, at page 6, lines 1-5, it is discussed that the driving AOTF frequency is adjusted based upon temperature, that is it compensates for the frequency shift occurring as a result of the temperature deviation by increasing or decreasing frequency."
>
> Additionally, claims 2 and 9 are rejected for not being clear as to which parameter is being regulated to a constant value. ***Therefore, applicant makes it clear the temperature of the AOTF is regulated to a constant value(see page 6, lines 13-15).*** Therefore, the rejection is respectfully overcome. ***(emphasis added)***

Subsequently, the Examiner **did not accept this "constant temperature value" language of claim 2** supported above and in the last amendment as persuasive or sufficient disclosure, again the "constant" language found at page 6, lines 13-15 states:

> "...the crystal" (which is the AOTF see fig. 2) "is heated to a range of greater than 35° C, for example, 40° C, ***and is maintained constant*** within a given window." ***(emphasis added).***

This is because the USPTO responds in the Final Office Action at page 5, "C)" that "The Examiner has reviewed page 6, lines 13-15 ... for a constant frequency and temperature value. Although, applicant states that the frequency can be adjusted, it appears that there is no suggestion that the above mentioned pages to keep the frequency or temperature constant."

Therefore, apparently ***when the specification specifically states that the temperature is held constant at page 6, lines 13-15,*** for example at 40 C° "for example, 40° C, ***and is maintained constant" this is somehow not deemed definite enough for one skilled in the art according to the USPTO under 35 USC 112, first paragraph***. Applicants respectfully disagree and assert that clearly the plain meaning of the specification explicitly states that the temperature value can be held constant.

Therefore, as claim 2 only claims "temperature" and doesn't explicitly mention "frequency," applicants respectfully assert that this 112 rejection (which is only directed to temperature per se) was properly overcome in the last amendment but the USPTO was not persuaded by this clear reasoning. Therefore, the 112 rejection of claim 12 is respectfully traversed again herein upon appeal.

b. The 35 U.S.C. §112, first paragraph rejection of independent claim 9.

Similar to the above, applicants also clearly responded to this rejection previously in the last Amendment filed on July 16, 2001, but the USPTO was similarly not persuaded.

The Final Rejection states that: "It appears that "regulation to a constant value" and driving the AOTF by "a constant frequency" is not described in the specification."

Applicants had previously responded to this by stating in the last amendment filed on July 16, 2001 at page 4 that:

> "Further, applicant believes that in claim 9, ***the claim language "constant frequency" should be amended*** to ***read "wherein said AOTF is driven by an optimized AOTF frequency to provide a constant laser output in the first order of diffraction."*** Said amendment is performed herein ***and is supported at least at page 6, lines 16-20.*** Therefore, the 112, first paragraph, rejection is believed to be overcome. ***(emphasis added).***

Thus, ***the central point that the USPTO misses is that applicants had amended out the language "by a constant frequency"*** (and also amended out the language "regulation to a constant value" which is now constant temperature) as discussed in the last Amendment filed July 16, 2001, ***and instead claim 9 claims the different language "optimized AOTF frequency." Therefore, applicants respectfully assert that the reasoning of the Final Office action is clearly in error because it is respectfully not even citing or talking about the correct claim language.*** In short, a rejection has to be based upon the current or pending claim language and not the inapplicable, old, claim language! Therefore, this rejection was respectfully traversed before, and is respectfully traversed again herein upon appeal.

Also, again, as discussed above, support for the above discussed amendments was previously cited in the previously filed amendment on July 16, 2001, i.e., at page 2, lines 15-24, at page 6, lines 1-5, lines 13-15, and lines 16-20. ***See particularly, page 6, lines 1-2,*** which states: "a computer which based on previously stored correction curves and a RS 232 driver circuit, adjusts and ***optimizes*** the AOTF frequency depending on the temperature..."

Therefore, the 112 rejection of claim 9 was previously properly traversed and supported and is respectfully traversed and supported again herein upon appeal.

II. The obviousness rejections of claims 2, 4-5, 7-8 and 9 are traversed below.

The USPTO rejects claims 2, 4-5, 7-8, and 9 in view of a combination of (1) the admitted prior art on pages 1-2 of the specification and (2) Kemeny, U.S. 5,039,855 under 35 U.S.C. §103(a).

Fundamental point made below: Kemeny teaches a spectrometer instead of a laser scanning microscope as claimed in the present invention, and also teaches the opposite teaching of purposefully varying temperature because it is a spectrometer and not a laser scanning microscope.

The obviousness rejections of independent claim 2, and its dependent claims 4-5, 7-8 are traversed below obviousness rejections of dependent claims 2, 4-5, 7-8, and 9 does not establish a prima facie case of obviousness as required under 35 USC 103(a) as described in detail in MPEP 706.02(j).

The reasoning at pages 3 through 5 of the Final Office Action concludes at page 4 that "it would have been obvious to one of ordinary skill in the art" ... to "add a temperature sensor , a heater and a heater regulator, as taught by Kemeny" to the device with the AOTF taught in the prior art in order to be able to provide corrections for variations in the temperature of the AOTF (Col. 13, lines 33-34) as suggested by Kemeny. And:

> "It would have also been obvious to one of ordinary skill in the art at the time the invention was made to modify the device disclosed by the Prior Art so as to drive the AOTF with a particular(constant frequency), as taught by Kemeny, because the application of the particular (constant) frequency to the AOTF changes the direction of

the propogation and polarization of the narrow wavelength band of the incident radiation, yielding two tuned radiation beams which diverge from each other and non-tuned radiation, with the tuned radiation beams being then used to analyze a sample (col. 2, lines 20-31), as already suggested by Kemeny.

It is also important to note that originally the obviousness rejection was based on a combination of four references including the two references remaining. In the Office Action dated October 10, 2000, paper No. 6, at page 5, ***the USPTO explicitly admitted that:***

> ***"The Prior Art, Kemeny and Fay do not explicitly disclose an AOTF being kept at constant temperature."***

Instead, a fourth reference **Nelson**, was cited for this teaching. Applicant respectfully traversed the Nelson teachings in the response filed January 19, 2001 without any amendment, ***and then in a reversal of logic in paper no. 10 at page 4, line 10,*** the USPTO decided that Kemeny did in fact suggest that limitation, i.e., Kenemy did ***disclose an AOTF being kept at constant temperature***." and applicants were left with the rejection based on the two references now at issue. ***However, paper No. 10, and the Final Rejection, also significantly qualified and narrowly limited the USPTO reasoning by admitting that:***

> "Kemeny also suggests to drive the AOTF at ***a particular frequency (in a broad sense,*** constant for at least a period of time) to tune a particular wavelength band (col. 11, lines 58-59)."

Therefore, as a preliminary matter, applicants assert ***that first the USPTO admitted that Kemeny did not teach the limitation and now the rejection states that it teaches it in "a broad sense."*** However, 35 USC 103 requires all of the limitations of the claims be taught or suggested by the combination of references. With the demonstrated uncertainty in the USPTO reasoning above, applicants can reasonably conclude that this showing has not been made as required, and respectfully request that at least an additional reference be cited to support the USPTO's position.

Second, in regard to the Kemeny spectrometer (not laser scanning microscope) applicant emphasizes the following point as discussed further below in detail:

Kemeny teaches and suggests use of purposeful changes in temperature so that the spectral range can be varied in the spectrometer, and the temperature is therefore not kept constant as in claimed ***in present invention, i.e. a laser scanning microscope.***

A significant difference is that in the Kemeny spectrometer, ***the spectrometer irradiates the AOTF with a white light source (not a laser of a laser scanning microscope)*** and selects a certain spectral range (wavelength) with the applied AOTF frequency. It is decisive for the Kenemy application that the spectral range of the working beam is changed via the frequency change. Therefore, frequency control by means of varying temperature control is required so that the spectral range can be **varied through purposeful changes of temperature. This is the opposite teaching of claims 2 and 9, which both claim regulation of said AOTF ... to a constant temperature value."** Claim 9 also claims a constant laser output, not a varying output.

This is because in a Laser Scanning Microscope, as opposed to the spectrometer of Kemeny, the AOTF is used to make collinearly superimposed laser lines with a bandwidth in

the sub-nanometer range individually accessible, meaning that essentially narrow spectral ranges can be selected.

Since the detected signal in, for example, fluorescent microscopy directly depends on the irradiated laser power, a constant excitation intensity is of great importance. If it drops, the detected signal (interaction with the object/fluorescent molecule) drops. Important information about properties of the examined biological sample can also be gained from the signal strength (for example, the concentration of certain ions (Ca++) during so-called ratio measurements, or the pH-value). In the examination of surface structures (confocal material microscopy), the detected intensity is an indication of the height of a structure. This means that a height profile can be determined from the intensity curve.

From this can be gathered that in a laser scanning microscope the frequency stability of an AOTF is of a great importance so that (opposite to what is done by Kemeny) the intensity of the output and excitation is maintained in a constant manner.

Therefore, the rejection at pages 3 through 6 of the Office Action of claims 2 and 4-9 and respectfully does not meet the standards for establishing a *prima facie* case of obviousness as required by 35 U.S.C. section 103 and as described in detail at MPEP 706.02(j) which is discussed in detail below.

The First Criteria: Motivation to Combine/Modify

The first criteria of a 35 U.S.C. §103 rejection as discussed in the Manual of Patent Examining Procedure, section 706.02(j) requires that the reasoning on pages 3 through 5 of the Office Action point to some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings.

The reasoning at pages 3 through 5 of the Office Action sets forth the teaching of the references: The Admitted Prior Art and Kemeny in combination and concludes at page 4 that it would have been obvious to one of ordinary skill in the art to "add a temperature sensor , a heater and a heater regulator, as taught by Kemeny to the device taught in the prior art in order to be able to provide corrections for variations in the temperature of the AOTF as suggested by Kemeny." However as noted above in the individual discussion of each reference, none of the references teach or suggest limitations of independent claims 2 or 9.

In summary of the above, this is because the cited Prior Art and Kemeny are admitted to not suggest keeping the temperature constant. Kemeny also teaches the opposite teaching of varying the temperature mainly because it is a spectrometer rather than a laser scanning microscope.

Therefore, none of the references teach or suggest all of the limitations of claim 2 or 9 as required by 35 USC 103. Therefore, at this time it, is respectfully asserted that there is no teaching or suggestion on the record of why it would have been obvious at the time of the invention for a person having ordinary skill in the art to view two references and then to develop the invention as claimed in independent claims 2 or 9 as discussed above. Rather, a hindsight

analysis would be required, for example, why would someone in the laser scanning microscope art look to the spectrometer art which in this case purposefully varies temperatures, in order to find a means in the laser scanning microscope art to keep temperature constant as claimed.

Therefore, the "motivation to combine" criteria of section 706.02(j) of the Manual of Patent Examining Procedure is respectfully not met by the reasoning presented at pages 3 through 6 of the Office Action in regard to independent claims 2 and 9.

The Second Criteria: Reasonable Expectation of Success

The second criteria of the Manual of Patent Examining Procedure, section 706.02(j) states that there must be a reasonable expectation of success to incorporate the alleged "regulation of said AOTF to a constant temperature and its environment to a constant temperature value" limitation into the admitted Prior Art and Kemeny. However, as it has been noted above, that no actual disclosure, teaching or suggestion of the limitations of independent claims 2 or 9 is taught by any of the two references (which teach actively varying temperature or teach nothing relevant) taken alone or in combination, it is respectfully asserted that no reasonable expectation of success can be based on a teaching that does not exist in the references or upon the opposite "temperature varying" teachings of Kemeny. Therefore, the second criteria of MPEP, section 706.02(j) is also respectfully not met by the reasoning presented of pages 3 through 6 of the Office Action.

The third limitation of MPEP 706.02(j) requires that the prior art references when combined must teach or suggest all the claimed limitations. As discussed above, it is respectfully asserted that the specific limitations of independent claims 2 and 9 are not taught or suggested or even disclosed by any of the two cited references when taken alone or together .

Therefore, in summary, it is respectfully asserted that the above discussion clearly shows that the criteria for establishing a *prima facie* case of obviousness as required by 35 U.S.C. section 103, and as described in detail at MPEP section 706.02(j), have not been met. Therefore, it is respectfully requested that independent base claims 2 and 9 be reconsidered and allowed.

Claims 4-8 depend from independent base claim 2, and are therefore also believed to be allowable. Thus, reconsideration and allowance of all of the claims is respectfully requested.

In sum, the reasoning is not specific enough and does adequately support the selection and combination of the references to render the claimed invention obvious. Instead, applicants respectfully assert that the final rejection is a conclusory statement based on an impermissible hindsight analysis. See MPEP 706.02(j). See In Re Sang Lee, US CAFC, 00-1158, decided January 18, 2002 which states that "the need for specificity pervades the authority" citing In re Kotzab, 217 F.3d. 1365, 1371, 55 USPQ2d 1313, 1317. Also see "teachings of references can be combined only if there is some suggestion or incentive to do so" ACS Hops. Sys. Inc V. Montefiore Hosp. 732 F.2d 1572, 1577, 221 USPQ 929,933 (Fed. Cir 1984).

Also, applicants respectfully note that no "official notice" and/or an affidavit of the Examiner's personal knowledge is taken to support the USPTO's conclusory statements above to support the obviousness reasoning as required by MPEP 2144.03.

Therefore, the rejection is believed to be respectfully traversed at least because the requirements for an obviousness rejection were not met by the reasoning at pages 4-5 of the Final Rejection as is required.

9. Conclusion

Applicant respectfully submits that this application is in condition for allowance, because the rejections of The Final Office Action are not valid under 35 U.S.C. §112, first paragraph or 35 U.S.C. §103(a) as described in MPEP 706.02(j). Therefore, these rejections should respectfully not be sustained by the Board of Appeals.

Respectfully submitted,

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APPENDIX

10. CLAIMS ON APPEAL

2. (Twice Amended) In a laser scanning microscope with an AOTF (acousto-optic tunable filter) in the laser input-coupling beam path, an improvement comprising:

a temperature gauge being provided in one of the environment of the AOTF and the vicinity thereof and connected therewith;

means for one of cooling and heating of the AOTF and its environment; and

wherein said means for one of heating and cooling includes regulation of said AOTF and its environment to a constant temperature value.

4. (Once Amended) The laser scanning microscope according to claim 2, wherein heating is carried out to a value above expected laboratory conditions.

5. The laser scanning microscope according to claim 4, wherein the value is above 35 degrees Centigrade.

7. (Once Amended) The laser scanning microscope according to claim 2, wherein the temperature gauge is connected to one of heating and cooling means by an electronic control for regulating the temperature.

8. (Once Amended) The laser scanning microscope according to claim 2, wherein the temperature gauge is connected with a driving unit for the AOTF.

9. (Once Amended) In a laser scanning microscope with an AOTF (acousto-optic tunable filter) in the laser input-coupling beam path, an improvement comprising:

a temperature gauge being provided in one of the environment of the AOTF and the vicinity thereof and connected therewith;

means for one of cooling and heating at least one of the AOTF and its environment; and

wherein said means for one of heating and cooling includes regulation of said at least one of the AOTF and its environment to a constant temperature value and wherein said AOTF is driven by an optimized AOTF frequency to provide a constant laser output in the first order of diffraction.